

M. Jeffrey Mei

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA June 2015 – September 2020

Woods Hole Oceanographic Institution, Woods Hole, MA

Ph.D., Oceanographic Engineering, MIT-WHOI Joint Program in Applied Ocean Science & Engineering

- Dissertation: "Morphological Approaches to Understanding Antarctic Sea Ice Thickness", defended August 2020

New York University Abu Dhabi, Abu Dhabi, United Arab Emirates August 2011 – May 2015

B.S. cum laude, Physics and Mathematics.

GPA: 3.8/4.0

- Senior thesis: "A Novel Two-Station Method For Locating Glacial Calving"

RESEARCH INTERESTS

I am generally interested in applying deep learning and computer vision methods to solve sea ice problems using remotely-sensed data. In particular, I am interested in snow depth distribution on sea ice and the morphology of deformed sea ice surfaces. I also focus on increasing the interpretability of deep learning methods using physically-plausible reasoning. Most of my work has been in estimating sea ice properties (snow depth, sea ice thickness, floe size) based on high-resolution remotely-sensed data (e.g. lidar and/or camera imagery from Operation IceBridge, ICESat-2). I am also passionate about helping create open-source research tools for the sea ice community.

RESEARCH EXPERIENCE

Graduate Research Assistant, MIT/WHOI Joint Program June 2015 – September 2020

- Applied convolutional neural networks to sea ice imagery to infer ice thickness and snow depth from surface topography, reducing error in sea ice thickness estimates from 50% to 20% (PyTorch, OpenCV, AWS EC2)
- Developed a textural segmentation algorithm to distinguish different deformed sea ice surfaces
- Developed a novel lead detection algorithm using lidar and camera data (OpenCV, Python)
- Collected sea ice data using surface laser (lidar) scans during 3-month winter fieldwork in Antarctica
- Created an interactive GUI for calculating sea ice floe size distribution from satellite imagery (OpenCV, Python)

Undergraduate Research Assistant, NYU Abu Dhabi 2013 – 2015

- Created a method for localizing glacial collapse using signal processing (Fourier transforms, bandpass filtering)
- Developed a spectrogram visualization tool to distinguish different types of seismicity (Python)

Select Peer-Reviewed Publications

- Mei, M.J., Maksym, T. Deep-Learning Predictions of Snow Depth on Antarctic Sea Ice. *Remote Sensing of the Environment* **2020**, *under review*.
- Mei, M.J., Maksym, T. A Textural Approach to Improving Snow Depth Estimates in the Weddell Sea. *Remote Sensing* **2020**, *12*, 1494. [doi:10.3390/rs12091494](https://doi.org/10.3390/rs12091494)
- Mei, M.J., Maksym, T., Weissling, B., Singh, H. Estimating early-winter Antarctic sea ice thickness from deformed ice morphology. *The Cryosphere* **2019**, *13*, 11, 2915-2934. [doi:10.5194/tc-13-2915-2019](https://doi.org/10.5194/tc-13-2915-2019)
- Mei, M.J., Holland, D.M., Anandakrishnan, S., Zheng, T. Calving localization at Helheim Glacier using multiple local seismic stations. *The Cryosphere* **2017**, *11*, 609-618, [doi:10.5194/tc-11-609-2017](https://doi.org/10.5194/tc-11-609-2017)
- Holland, D.M., Voytenko, D., Christianson, K., Dixon, T.H., Mei, M.J., Parizek, B.R., Vankova, I., Walker, R.T., Walter, J.I., Nicholls, K., Holland, D. An intensive observation of calving at Helheim Glacier, East Greenland. *Oceanography* **2016**, *29*(4):46–61. [doi:10.5670/oceanog.2016.98](https://doi.org/10.5670/oceanog.2016.98)

Select Conference Publications

- Mei, M. Jeffrey, Ted Maksym, "A textural approach to snow depth distribution on Antarctic sea ice." *European Geophysical Union General Assembly*, online. **2020**. [\[link\]](#)
- Mei, M. Jeffrey, Ted Maksym, "Estimating Early-Winter Antarctic Sea Ice Thickness From Deformed Surface Morphology." *International Glaciological Society Sea Ice Symposium*. Winnipeg, Canada. **2019**. [\[link\]](#)
- Mei, M. Jeffrey, Ted Maksym, Arnold Song, Matthew Parno, Guy Williams, Hanumant Singh, Jeffrey Anderson, Alek Razdan. "PIPERS: Sea Ice Thickness Redistribution From Early Winter Deformation." *2018 SCAR/IASC Conference*. Davos, Switzerland. **2018**. [\[link\]](#)
- Mei, M. Jeffrey, Tiantian Zheng, David M. Holland. "A Novel Seismic Method for Glacial Calving Localization." *American Geophysical Union Fall Meeting 2015*. San Francisco, USA. **2015**. [\[link\]](#)
- Mei, M.Y. Jeffrey, I. Zaw, and L. J. Greenhill. "Correlations of Circumnuclear Water Maser Luminosity with AGN Activity and SMBH Mass." *American Astronomical Society Meeting Abstracts #223*. Vol. 223. Washington D.C., USA. **2014**. [\[link\]](#)

Workshop participation

- ICESat-2 Hackweek, University of Washington Polar Science Center, 2019

TEACHING AND LEADERSHIP

MIT Badminton Club, MIT 2016 – 2020

President (2019-2020), Treasurer (2016-2019)

- Managed club financials (annual budget \$8000), including equipment ordering and fundraising
- Oversaw player registration, facilities reservations and liaised with sponsors for the Boston Open (2nd-largest badminton tournament in the USA)

12.720 Elements of Modern Oceanography, MIT Fall 2018

Teaching assistant

- Explained physical oceanography concepts to 25 first-year graduate students with no prior physics experience
- Improved scientific rigor of students research projects with one-on-one feedback

Summer Math Review, WHOI 2017 – 2018

Organizer and instructor

- Organized courses and assigned instructors for summer math review for ~20 incoming graduate students
- Instructor for ordinary/partial differential equations, data analysis, numerical methods for ODEs

HONORS AND AWARDS

- SCAR Open Science Conference Travel Grant, 2018
- MIT Graduate Student Leadership Institute Fellow, Fall 2016
- New York University Honors Scholar, 2015
- NYU Abu Dhabi Summer Research Grant, 2012 – 2014
- NYU Abu Dhabi full scholarship, 2011-2015
- University of Auckland full scholarship, 2010
- NZQA Outstanding Scholar Award (top 30 students nationally), 2010
- Medallist (top 2 students nationally), Australian Mathematics Competition, 2010
- First prize, New Zealand's Next Top Engineering Scientist Competition, 2010

PROFESSIONAL MEMBERSHIPS AND CERTIFICATIONS

- European Geophysical Union, 2018 –
- American Geophysical Union, 2015 – 2016
- PADI Open Water Diver, 2013 –

OTHER SKILLS

Fluent in English (native), Mandarin Chinese (native), German (C1); conversant in Russian (B1/B2)
 Experienced with Python (numpy/sklearn/pytorch/pandas), SQL, AWS, OpenCV, Linux/Unix, bash, Latex